6.0 Grand Junction, Colorado, Disposal Site

6.1 Compliance Summary

The Grand Junction, Colorado, Disposal Site, inspected on April 4, 2007, is in good condition. A portion of the disposal cell remains open and is operated by DOE to receive additional low-level radioactive waste materials from various sources. The annual inspection requirement is only applicable to the closed and completed portion of the disposal cell and surrounding disposal site.

DOE is evaluating relatively low-cost methods for renovating conventional (low-permeability) covers at the site. Groundwater monitoring was performed as a best management practice. Maintenance performed in 2007 included repairing a gully on the disposal cell top, replacing a broken perimeter sign, cutting and treating tamarisk, and deepening the east storm water collection pond. No significant problems or issues were noted, and no cause for a follow-up inspection was identified.

6.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Grand Junction, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site are specified in the *Interim Long-Term Surveillance Plan* [LTSP] *for the Cheney Disposal Site Near Grand Junction, Colorado* (DOE/AL/62350–243, Rev. 1, U.S. Department of Energy [DOE], Albuquerque Operations Office, April 1998), and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27) and 40 CFR 192. These requirements are listed in Table 6–1.

Table 6–1. License Requirements for the Grand Junction, Colorado, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 6.3.1
Follow-up or Contingency Inspections	Section 3.0	Section 6.3.2
Routine Maintenance and Repairs	Sections 2.7.3 and 4.0	Section 6.3.3
Groundwater Monitoring	Section 2.6	Section 6.3.4
Corrective Action	Section 5.0	Section 6.3.5

Institutional Controls—Verification of institutional controls is required as part of the annual inspection. Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no trespassing signs placed along the property boundary, and a locked gate at the entrance to the site access road.

The United States of America owns the 360-acre disposal site. DOE currently is, and will remain, the disposal site operator until final closure. Only closed and completed parts of the disposal cell and the area surrounding the disposal site are addressed during the annual inspection. Approximately 21 acres in the center of the disposal cell is active to receive residual radioactive material (RRM). The active area, the temporary structures associated with its operation, and the temporary contaminated material stockpile areas, are not part of the annual inspection except as they may affect the long-term safety and performance of the closed portion of the disposal cell.

Weekly environmental and security inspections of the entire site are performed to verify the site is secure, and radon is monitored continuously to ensure the open portion of the cell is protective of human health and the environment. This portion of the disposal cell is scheduled to remain open until 2023, or until filled to its design capacity, at which time it will be closed in accordance with design criteria. Upon concurrence with the final closure of the open portion of the cell and the final version of the LTSP, the site will be accepted under the U.S. Nuclear Regulatory Commission general license (10 CFR 40.27). DOE will then become the licensee and, in accordance with the requirements for UMTRCA Title I sites, will be responsible for the custody and long-term care of the site. The open and active portion of the disposal cell within the closed but unlicensed portion of the disposal cell makes the Grand Junction, Colorado, Disposal Site unique among the 19 UMTRCA Title I disposal sites.

Inspectors found no evidence that these institutional controls were ineffective or violated.

6.3 Compliance Review

6.3.1 Annual Inspection and Report

The site, located south of Grand Junction, Colorado, was inspected on April 4, 2007. Results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 6–1. Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

6.3.1.1 Specific Site Surveillance Features

Site Access Gate, Access Road, Entrance Gate and Fence—Access to the site is controlled by two double swing stock gates, one in the U.S. Highway 50 right-of-way fence and a second 1.7 miles east at the site entrance. The DOE locks, chains, and gates were in excellent condition.

A paved all-weather access road extends approximately 1.7 miles east from U.S. Highway 50 along DOE's perpetual right-of-way, through federal land administered by the U.S. Bureau of Land Management (BLM). No erosion problems were observed along the access road. The fence along the right-of-way corridor is secure and in excellent condition.

Entrance and Perimeter Signs— An entrance sign is located at the entrance gate, and 29 perimeter signs are located at regular intervals along the DOE property boundary. The signs are installed on galvanized steel posts set in concrete. Perimeter sign P17 was found damaged
6A and replaced. Several signs are slightly bent or warped but are legible. All of the other signs are in excellent condition. The base of perimeter sign P24 had been slightly displaced when hit by road grading equipment but is stable.

Additional warning signs are posted on the wire perimeter fence and are associated with the operation of the open cell. Metal "Controlled Area" signs and yellow plastic "No Trespassing" signs are secured to the fence in pairs. There are 75 warning sign locations, each about 200 feet apart along the site boundary.

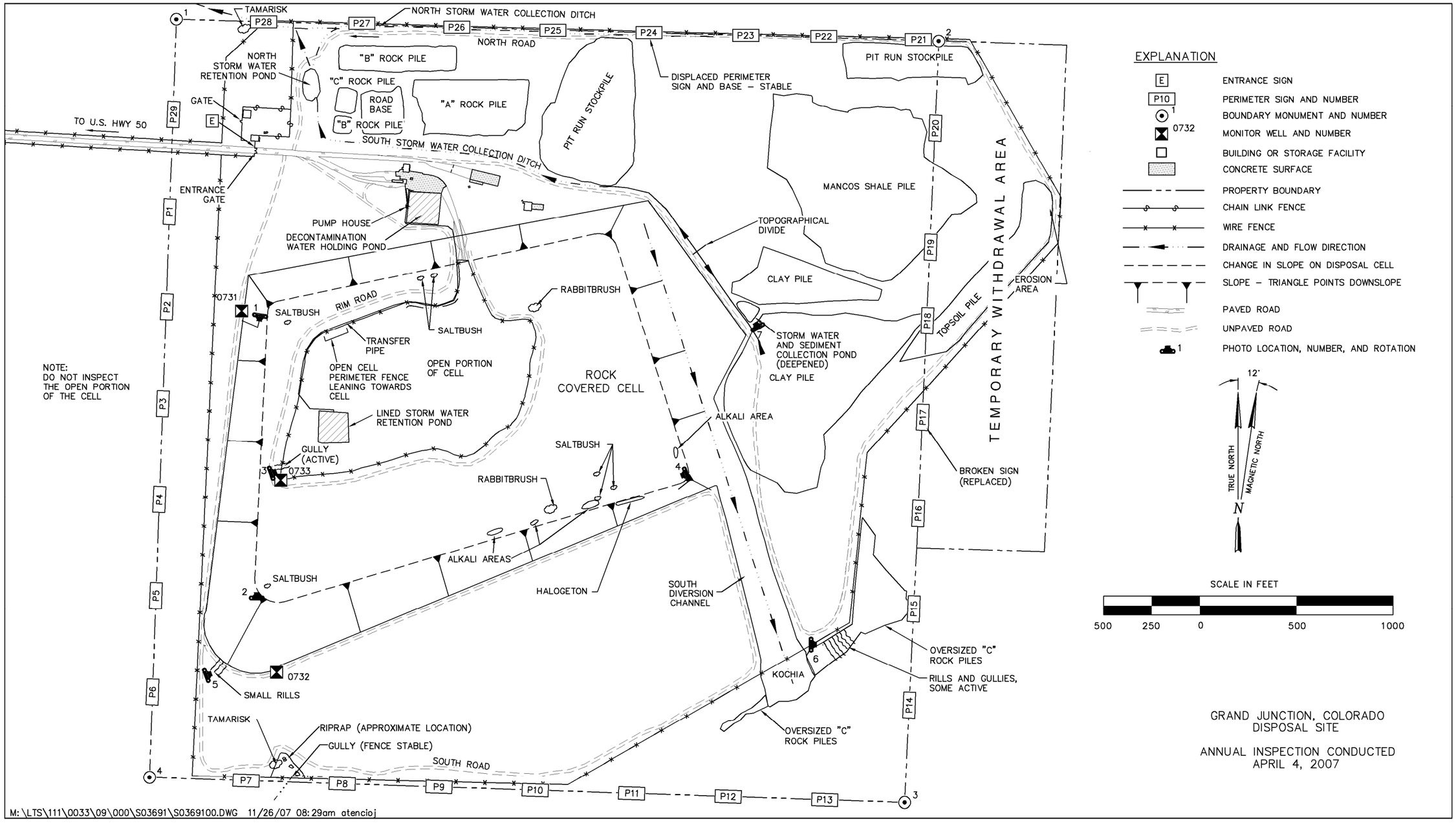

Figure 6–1. 2007 Annual Compliance Drawing for the Grand Junction, Colorado, Disposal Site

Site Marker and Boundary Monuments—The granite site markers installed at other sites will not be installed at this site until the entire disposal cell is closed.

The site has four permanent boundary monuments, one at each of the four corners. The monuments mark the exact location of the site corners. All were in excellent condition.

Monitor Wells—The groundwater-monitoring network consists of three monitor wells. All three wells are inside the site boundary. The wells were secure and in excellent condition.

6.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into five areas referred to as transects: (1) the closed portion of the disposal cell; (2) the diversion structures and drainage channels; (3) the area between the disposal cell and the site boundary; (4) the site perimeter; and (5) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, settling, slumping, or other phenomenon that might affect site integrity or the long-term performance of the site.

Closed Portion of the Disposal Cell—The top and side slopes of the disposal cell are covered with basalt riprap. The rock is durable and in excellent condition. There is no evidence of slope instability and very little plant encroachment is occurring on the side slopes (PL–1 and PL–2).

Runoff drains toward the southeast corner of the cell. Several small areas with evaporite deposits are present on the cover near the southeast corner. There was no evidence of settling or erosion of the cell cover, so these features are not a concern.

6B A small gully has formed on the disposal cell cover that drains and is mobilizing a minor amount of sediment onto the southwest slope of the open cell area (PL–3). This location was repaired to prevent further erosion into the open portion of the cell.

Grasses and weeds grow on most of the cell cover, and scattered deep-rooted vegetation (primarily shrubs) has been persistent on the cover (PL–4). Deep-rooted vegetation was sprayed with herbicide in 2006, and the dead vegetation was evident. Some shrubs have started to grow back and their locations were noted during this inspection. Control of deep-rooted vegetation on the disposal cell continues.

Severe rainstorm events during fall 2006 apparently caused the cell apron (a rock-filled trench) to overflow at the southwest corner of the disposal cell. Several small rills developed across the apron perimeter road (PL–5), but are insignificant and do not require repair at this time.

6C DOE constructed a test facility at the site to evaluate relatively low-cost methods for renovating conventional (low-permeability) covers. The study, the Renovated ET Cover Assessment Project

(RECAP), consists of two swimming-pool size drainage lysimeters designed for large-scale testing of cover performance.

DOE believes that cover renovation may lead to reduced risk and cost over the long term. Research by DOE and EPA has shown that permeability and percolation in conventional covers, as monitored in situ after construction, are often 100 to 1000 times higher than the design target. In contrast, percolation in alternative covers that rely on thick soil layers and plant evapotranspiration (ET), to store and remove precipitation, is often 10 to 100 times lower than design targets. Furthermore, the cost of vegetation management on conventional covers increases as plant habitat develops naturally over time.

Plants may be the solution not the problem. The RECAP facility, constructed adjacent to the disposal cell, will compare the performance of the existing cover design with a renovated ET cover design. The test covers in both lysimeters were constructed to match, as close as possible, the materials and design criteria used for the exiting disposal cell cover. After several months of baseline monitoring, DOE will plant one of the two test covers, and then continue comparing their performance. DOE plans to weigh the results of the study in future LTSM decisions.

Diversion Structures and Drainage Channels—The south diversion channel is a large riprap-armored structure that conveys runoff water from the disposal cell southeast into a natural drainage that flows away from the site to the southwest. The diversion channel is in excellent condition. Some plant growth, including grasses, weeds and deep-rooted shrubs, exists within the channel. However, there is not enough growth to impede water flow within the channel. Erosional features at the outfall of the channel are self-armoring with large riprap boulders and are stable. An area of active erosion was noted east of the outfall area (PL–6), but no surveillance features are threatened and the area is expected to stabilize.

Other drainage features at the site include north and south storm water collection ditches, the north storm water retention pond, and a storm water and sediment collection pond on the east side of the south diversion channel. These small drainage features control storm water runoff primarily from the various cover materials stockpiled on the northern and eastern portions of the disposal site property. The north storm water collection ditch also captures run-on storm water from a large catchment area north and east of the disposal site. The drainage ditches and the
6D north storm water retention pond are functioning as designed. The east storm water collection pond (PL–7) was deepened to control runoff leaks onto the adjacent access road; the material removed was used to align the edge of the south storm water collection ditch. Additional maintenance may be needed in the future to retain the ponded water.

Area Between the Disposal Cell and the Site Boundary—There are 12 discrete stockpiles of rock and soil between the disposal cell and the site boundary on the north and east sides of the disposal cell. These materials eventually will be used to cover and close the open cell. A small area of erosion was noted on the topsoil pile near the east perimeter fence. However, natural vegetation is generally well established and is protecting the stockpiles from significant erosion.

On the south and west sides of the disposal site, between the disposal cell and the perimeter fence, the ground is relatively flat and covered with native vegetation that consists primarily of

perennial grasses and small shrubs. No erosion was observed in the undisturbed areas south and west of the disposal cell.

Small isolated stands of tamarisk observed growing along the south side and northwest corner of the site were removed. Although the plants at these locations do not threaten the integrity or performance of the disposal cell, they will continue to be cut and treated with herbicide to remove the seed source reducing the chance of the plants establishing on the disposal cell. 6E

Site Perimeter—The perimeter fence surrounding the site consists of a combination of square wire mesh at the bottom and two strands of barbed wire along the top, both supported by steel t-posts. The fence was in good condition and there was no evidence of livestock entering the enclosed area.

The fence runs along or near the property line on the north and south sides of the site, about 200 to 300 feet inside the property line on the west, and as much as 1,000 feet inside at the southeast corner of the site. On the east side, the fence extends beyond the site boundary to enclose part of an adjoining 40-acre temporary withdrawal area that is federal land administered by BLM. The temporary withdrawal area is not included in the interim LTSP and, therefore, is not formally inspected. DOE uses the temporary withdrawal area to stockpile cover materials for the eventual closure of the open portion of the cell.

A gully has developed along the south perimeter fence (near perimeter sign P8) on the fringe of a riprap-armored drainage area. The gully is encroaching on the fence line; however, the fence and posts were taut and secure at the time of the inspection.

Outlying Area—The area outward from the disposal site for a distance of 0.25 mile was visually inspected. No development or disturbance that could affect the disposal site was observed. Most of the land surrounding the site is rangeland administered by BLM. The land is covered by native grass and shrubs, and is used primarily for cattle grazing.

6.3.2 Follow-up or Contingency Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2007.

6.3.3 Routine Maintenance and Repairs

In 2007, DOE performed the following maintenance at the site:

- The gully on the southwest slope of the open portion of the cell was repaired to prevent further erosion.

- The storm water and sediment collection pond on the eastern side of the diversion channel was deepened and the material used to align the edge of the south storm water collection ditch in order to prevent runon onto the access road.
- Tamarisk was cut and treated with herbicide.
- Perimeter sign P17 was replaced.

6.3.4 Groundwater Monitoring

Monitoring of groundwater in the uppermost aquifer (Dakota Sandstone) beneath the disposal site is not required because the groundwater is of limited use, based on the total dissolved solids (TDS) content exceeding 10,000 milligrams per liter (mg/L) (40 CFR Part 192.21(g)). Confined groundwater in the uppermost aquifer lies approximately 750 feet below the existing ground surface and is hydrogeologically isolated from the tailings material by mudstones and shales of the Mancos Shale.

6F In lieu of monitoring groundwater in the uppermost aquifer, DOE voluntarily monitors groundwater as a best management practice in two monitor wells in or very near buried alluvial paleochannels adjacent to the disposal cell (MW−0731 and MW−0732) and one monitor well in the disposal cell (MW−0733) to assess performance of the disposal cell and to ensure that any groundwater in the paleochannels is not impacted by seepage (transient drainage) from the disposal cell (Table 6–2). The paleochannel wells are along the west (downgradient) edge of the disposal cell and are screened at the interface between the alluvium and shallow Mancos Shale. The third well is in the southwest corner of the open portion of the disposal cell and is used primarily for measurement of water levels in the deepest part of the disposal cell to demonstrate that groundwater directly beneath the disposal cell has not risen high enough to move laterally into the paleochannels.

Table 6–2. Groundwater Monitoring Network at the Grand Junction, Colorado, Disposal Site

Monitor Well	Hydrologic Relationship
MW−0731	Paleochannel, downgradient, edge of cell, north side
MW−0732	Paleochannel, downgradient, edge of cell, south side
MW−0733	Disposal cell, deepest location, downgradient, center

Groundwater Level Monitoring— Static water level measurements are obtained from each well prior to the collection of water quality samples (Figure 6–2). In September 2006, data loggers were installed in each well to obtain continuous water level measurements (4 hour interval).

The water level in the disposal cell well MW−0733 has displayed a steady continual rise, although relatively minor; approximately 2 feet of increase since 1998. This continued through the 2007 monitoring, with an increase of approximately 0.5ft. The water level in the disposal cell well MW−0733 has remained significantly deeper than water levels in the paleochannels at wells MW−0731 and MW−0732, respectively, since 1998 (Figure 6–2).

Water levels within the two paleochannels at wells MW−0731 and MW−0732 have displayed a decrease, although more varied and larger; approximately 4 to 5 feet of decrease since 1998. In 2007 these two wells showed slight increases, but still are below initial levels in 1998.

On the basis of this information, there is no hydraulic potential for groundwater at the base of the disposal cell at well MW−0733 to migrate to the paleochannels at wells MW−0731 and MW−0732.

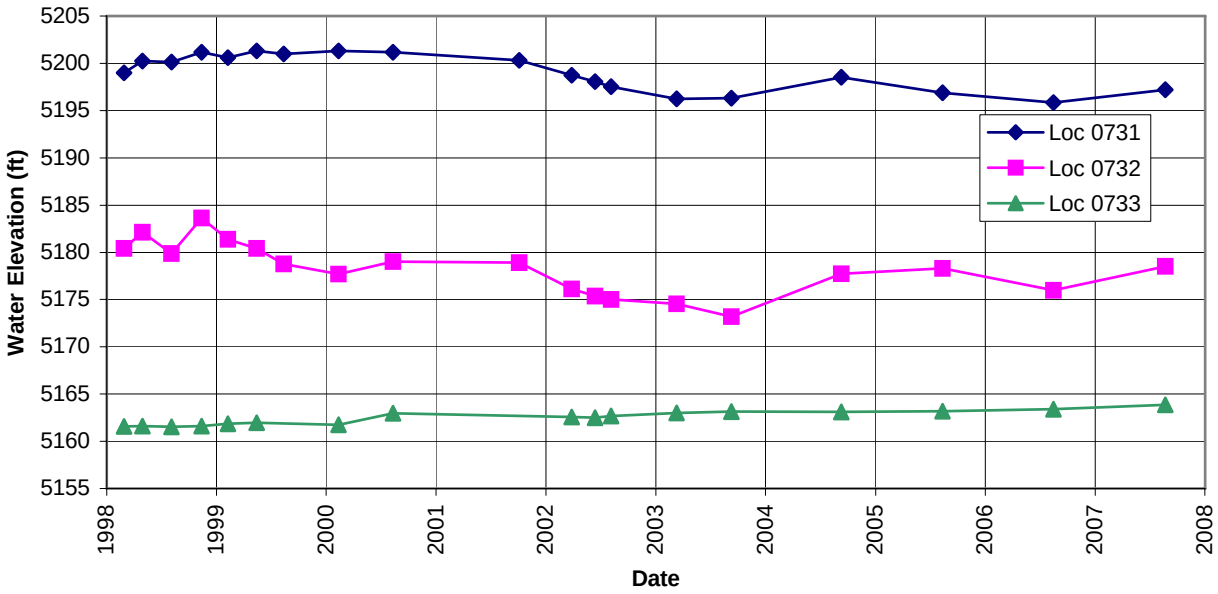

Figure 6–2. Water Level Measurements at the Grand Junction, Colorado, Disposal Site

Groundwater Quality Monitoring—Groundwater samples are analyzed for standard field parameters and the following indicator analytes: molybdenum, nitrate, selenium, sulfate, TDS, uranium, vanadium, and polychlorinated biphenyls (PCBs). Key indicator analytes are molybdenum, nitrate, selenium, and uranium. In 40 CFR 192 Table 1 in Subpart A, the U.S. Environmental Protection Agency (EPA) has established maximum concentration limits (MCLs) for these analytes in groundwater (Table 6–3). Time-concentration plots, from 1998 through 2007, for three key indicator analytes—nitrate (as nitrogen), selenium, and uranium are shown on Figures 6−3 through 6−5.

Table 6–3. Maximum Concentration Limits for Groundwater at the Grand Junction, Colorado, Disposal Site

Constituent	MCL [a] (mg/L)
Molybdenum	0.1
Nitrate (as N)	10
Selenium	0.01
Uranium	0.044

[a]EPA MCLs as listed in 40 CFR 192 Table 1, Subpart A.
MCL = maximum concentration limit.
Mg/L = milligrams per liter.

Nitrate (as nitrogen) concentrations in groundwater continue to exceed the MCL of 10 mg/L in the paleochannel monitor wells (MW-0731 and MW0732) through 2007 (Figure 6–3). Concentrations in well MW–0731, following an initial steep downward trend, remained below the MCL from 2000 through 2004. In 2005, and continuing through 2007, concentrations were above the MCL. Concentrations in well MW–0732, although varied, have consistently remained above the MCL since 1998. Concentrations in well MW–0733 continue a significant downward trend, just slightly above the MCL in 2006, and reaching an historical low of 9.9 mg/l in 2007. Historically, the highest concentration of nitrate (96 mg/L) occurred in 1998 from the disposal cell well MW–0733. In 2007, the highest concentration of nitrate, 35 mg/L, occurred in paleochannel well MW–0732.

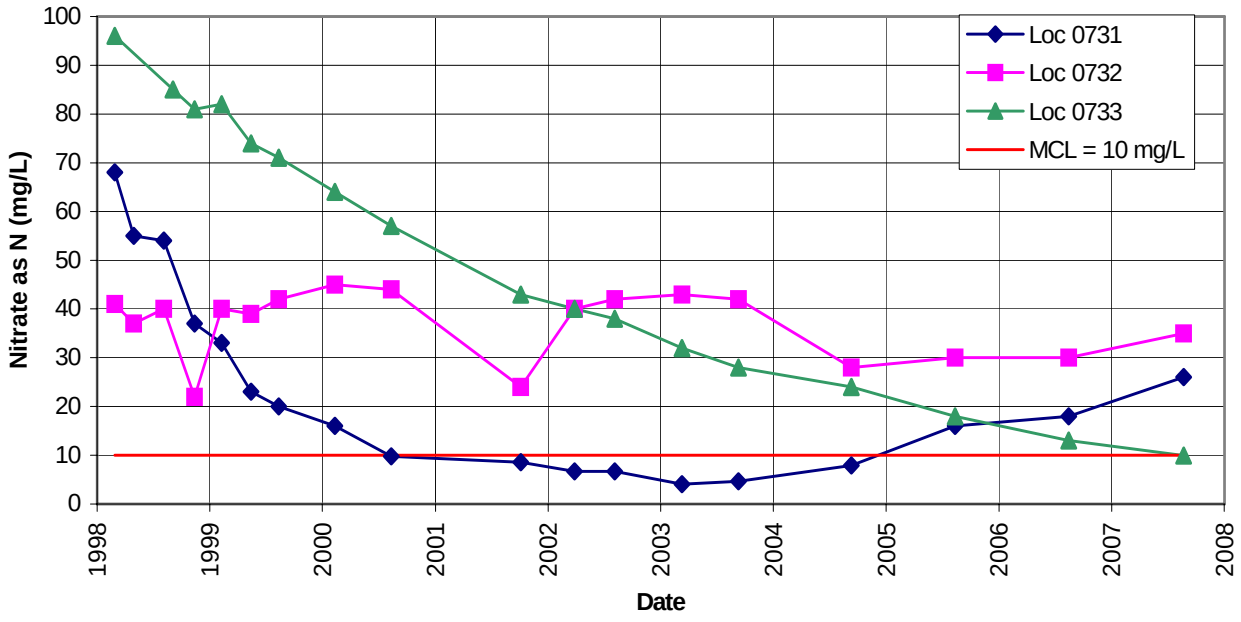

Figure 6–3. Time-Concentration Plots of Nitrate (as N) in Groundwater at the Grand Junction, Colorado, Disposal Site

Selenium occurs naturally in the Mancos shale deposits that underlie the disposal cell and may be the cause of the elevated concentrations reported in both paleochannel monitor wells MW–0731 and MW–0732. Selenium concentrations continued to exceed the MCL of 0.01 mg/L in

wells MW–0731 and MW–0732 (Figure 6–4). Concentrations in well MW–0731 displayed a sharp decreasing trend, with the decreasing trend continuing until 2003, at which time a slight upward trend began. In 2007 concentrations in both wells decreased approximately 0.1 mg/L. The selenium concentration (0.0025 mg/L) remained well below the standard in well MW–0733. The concentrations in this well have remained remarkably stale since 2001. In 2007, the highest concentration of selenium, 0.47 mg/L, occurred in paleochannel well MW–0731.

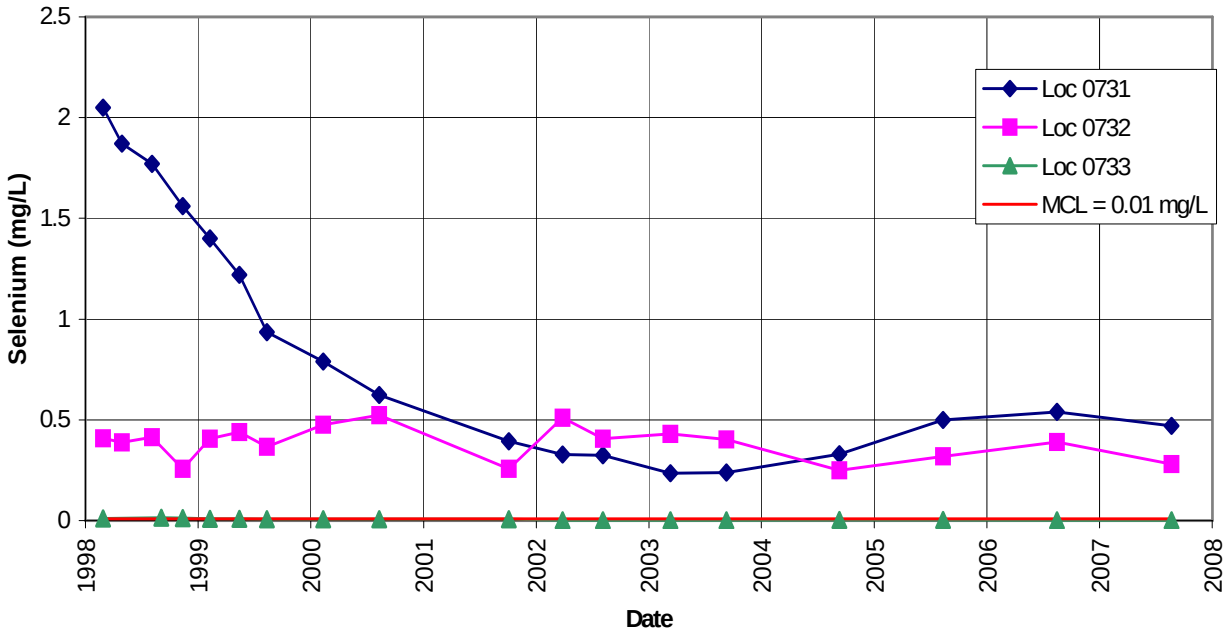

Figure 6–4. Time-Concentration Plots of Selenium in Groundwater at the Grand Junction, Colorado, Disposal Site

Uranium concentrations in groundwater were below the MCL of 0.044 mg/L in samples from the two paleochannel wells MW–0731 and MW–0732, but were reported above the MCL in well MW–0733 (0.051 mg/L) for the first time (Figure 6–5). Concentrations in well MW–0731, after an initial increase, have displayed a decreasing trend that continued in 2007. Concentrations in wells MW–0732 and MW–0733 remained relatively consistent through 2003, at which time an upward trend began in both wells; although, in 2007, the concentrations in well MW–0732 decreased slightly.

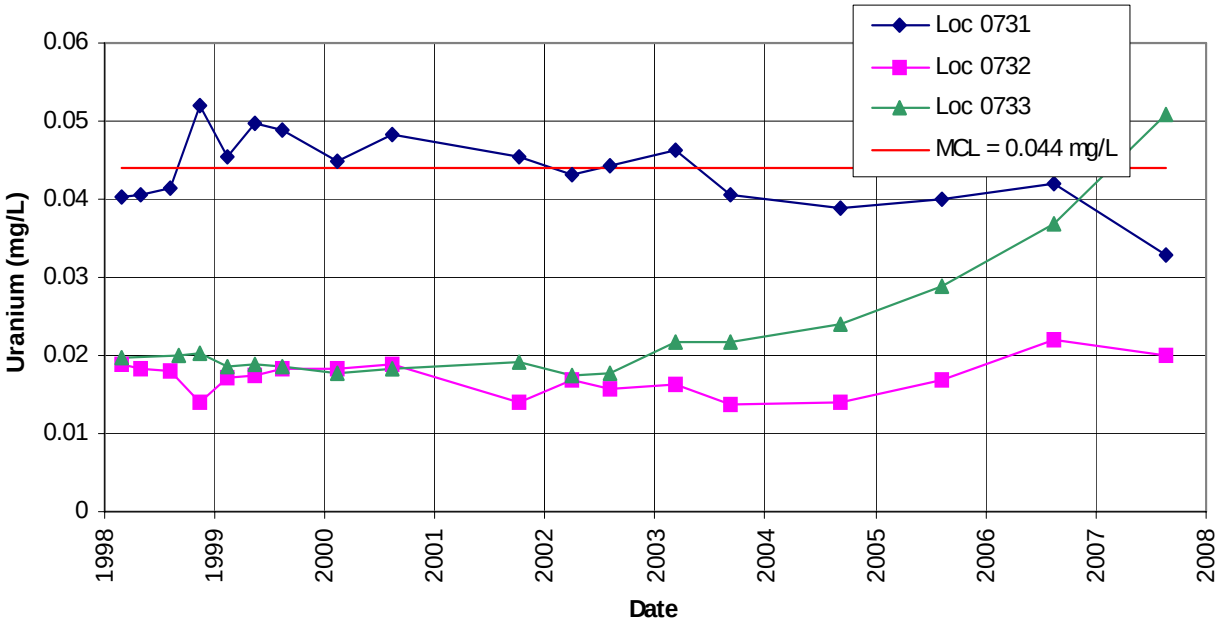

Figure 6–5. Time-Concentration Plots of Uranium in Groundwater at the Grand Junction, Colorado, Disposal Site

6.3.5 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192.

No corrective action was required in 2007.

6.3.6 Photographs

Table 6–4. Photographs Taken at the Grand Junction, Colorado, Disposal Site

Photograph Location Number	Azimuth	Photograph Description
PL–1	190	View south along the west side slope and apron.
PL–2	0	View north along the west side slope.
PL–3	70	Gully at the southwest corner of the open cell area.
PL–4	250	Deep-rooted vegetation on the southeast portion of the disposal cell cover.
PL–5	70	Rills at the southwest corner of the disposal cell.
PL–6	90	Rills and gullies east of the south diversion channel outfall.
PL–7	330	Storm water and sediment collection pond adjacent to the south diversion channel.

GRJ 4/2007. PL–1. View south along the west side slope and apron.

GRJ 4/2007. PL–2. View north along the west side slope.

GRJ 4/2007. PL–3. Gully at the southwest corner of the open cell area.

GRJ 4/2007. PL–4. Deep-rooted vegetation on the southeast portion of the disposal cell cover.

GRJ 4/2007. PL–5. Rills at the southwest corner of the disposal cell.

GRJ 4/2007. PL–6. Rills and gullies east of the south diversion channel outfall.

GRJ 4/2007. PL–7. Storm water and sediment collection pond adjacent to the south diversion channel.